

MEDICAL BOARD CLEANING SYSTEM ASSEMBLY DESCRIPTION

SPECIFIC DATA RELATED TO INVENTION

This application claims the benefit of the U.S. provisional patent application filed on November 7, 2000 and assigned serial number 60/246,435.

5 BACKGROUND OF THE INVENTION

The present invention relates generally to medical transport boards, sometimes referred to as spine boards, and, more particularly, to apparatus for cleaning and disinfecting such boards.

10 Medical transport boards are boards that are generally used by emergency medical personnel for transporting accident victims. These boards, which are sometimes referred to as spine boards, are typically made of plastic, fiberglass, or other synthetic material and are designed to be lightweight but strong, stiff boards that prevent movement of a person strapped to the board during transport of the person. Since these boards are commonly used to transport accident victims, the boards are frequently contaminated
15 with blood or other body fluids and must be thoroughly cleaned and disinfected after each use. Typical methods of cleaning such boards include spraying the boards with water, soap solutions, disinfectants and manually scrubbing the boards by hand to remove any material on the boards.

20 One prior attempt to automate cleaning of medical transport boards is described in U.S. Patent No. 5,472,004 issued December 5, 1995. The '004 patent discloses a washing system for a medical transport board, referred to therein as a spine board, in which the board is placed into a housing and subjected to a high pressure spray from a plurality of nozzles positioned about the board wherein the spray is intended to remove any contaminants from the board. The disclosed spray system includes a pump for
25 delivering 8.5 gallons per minute at a pressure of 95psi in order to attempt to clean and disinfect spine boards. According to the '004 patent, a spine board may remain in the unit for up to thirty minutes in order to be cleaned by the impinging spray.

Applicants' have evaluated the cleaning of spine boards or medical transport boards by use of spraying under the conditions specified in the '004 patent and found that the disclosed method is generally inadequate to completely clean dried body fluids from a spine board. More particularly, dried body fluids such as blood tends to leave
5 discolorations that may not be completely removed by spraying and, while such splotches may not be harmful, they are disconcerting to persons handling the medical transport board. Accordingly, it is desirable to provide a method which more effectively removes discolorations on such boards caused by body fluids as well as other materials.

10 SUMMARY OF THE INVENTION

The present invention addresses the shortcomings of prior art attempts to automate the cleaning of medical transport boards by providing a cleaning system that uses a combination of high volume, low pressure soaking coupled with stiff brush action to scrub the surfaces of the board. In a preferred embodiment, the invention comprises an
15 electrically operated apparatus including a housing having a closed chamber through which a board is directed in order to be cleaned. Within the chamber, there is a first section having multiple spray nozzles for spraying the board first with water for wetting and then spraying with a disinfectant solution for decontamination. As the board exits the first section, it is directed through a pair of rotating brushes which include relatively
20 hard nylon bristles for scrubbing the top and bottom exposed surfaces of the board. Preferably, the brushes are designed to rotate in a common direction so that one of the brushes pushes the board backwards while the other of the brushes pulls the board forward to thereby create a null force on the board. After the board passes through the brushes, it enters into a second section in which are arranged a plurality of spray nozzles
25 for spraying clear water on the board to rinse away any debris left after passing through the brushes. The board then exits the housing having been washed, brushed and rinsed.

BRIEF DESCRIPTION OF THE DRAWINGS

For a better understanding of the present invention, reference may be had to the following detailed description taken in conjunction with the accompanying drawings in which:

5 FIG. 1 is a perspective view of one form of medical transport board cleaning unit with a transport board partially extending from one end of the unit;

FIG. 2 is a simplified cross-sectional view of the apparatus of FIG. 1 showing the medical transport board extending fully through the cleaning apparatus;

10 FIG. 3 is a right side exploded perspective view of the cleaning apparatus of the present invention;

FIG. 4 is a left side exploded perspective view of the cleaning apparatus of the present invention;

FIG. 5 is a transverse cross-sectional view of the brush area of one form of the invention; and

15 FIG. 6 is a cross-sectional view lengthwise of the apparatus of FIG. 5.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIG. 1, there is shown a front perspective view of one form of a medical board cleaning apparatus 10 according to the present invention. The apparatus 10 includes a housing 12 supported on legs 14. The housing 12 has a front access opening 16 from which a portion of a medical transport board 18 is shown protruding. FIG. 1 also shows a flexible drain 20 extending from a bottom of the apparatus 10. Located on a top surface of apparatus 10 is a filler cap 22 providing access to a disinfectant storage tank located inside the apparatus 10. On the front end of the apparatus are control switches 24 which actuate the unit for cleaning. The view of apparatus 10 simply shows the basic chassis or framework of the present invention with the housing 12 forming a cabinet assembly supported on the legs of 14. It will be appreciated that the housing 12 could be provided without the support legs 14 if it were desired to provide other support under the housing. The housing 12 may be formed of sheet metal or other suitable material such as

plastic or fiberglass with appropriate inner structural components to support the sheet material.

Turning now to FIG. 2, there is shown a simplified functional cross-sectional view of the cleaning apparatus 10 of FIG. 1. As can be seen, the housing 12 is divided into three internal sections 26, 28 and 30. Section 26 is a first section through which the board 18 is introduced into the housing. As the board is pushed through the apparatus 10, it next passes through the section 28 containing rotating brushes 32. Thereafter the board passes into the final section 30 before exiting from an opposite end of the housing. The sections 26 and 30 are separated from the section 28 by partitions 34 and 36. The partition 34 defines the extent of the section 26 while the partition 36 defines the extent of the section 30. Within the section 26 there is located a first pair of order delivery lines 38 and a second pair of disinfectant delivery lines 40. The delivery lines 38 provide a water flow to wet the surface of board 18 prior to soaking the surface with the disinfectant spray from the lines 40. It will be seen that the lines 38 and 40 are arranged to provide for a spray source to concurrently spray both the upper and lower exposed surfaces of the board 18.

As a leading edge of the board 18 begins to exit the section 26, it enters into the section 28 and is passed between the pair of opposed rotating brushes 32. Preferably the brushes 32 are stiff nylon brushes and arranged to exert substantial pressure on the surfaces of the board 18. As will be further explained, the brushes 32 are driven so as to both rotate in a same direction, i.e., either both rotating clockwise or both rotating counterclockwise. The effect of having the brushes 32 rotate in the same direction is to create a force by one brush attempting to pull the board through the housing 12 while at the same time providing an opposing and equal force attempting to push the board backwards out of the housing 12. The effect of the two brushes thereby cancel each other and result on a null force on the board so that it can be easily moved by an operator exerting a small amount of force to push the board in either one direction or another. Further, the unit can be operated by a single person since the board can be pushed into the housing until an end of the board begins to protrude from an opposite end of the housing

and will remain stationery while the operator walks around the housing to reach the other end where the board can then be pulled out of the housing.

After passing through the brushes 32, the board next enters into the section 30 which contains multiple water lines 42. These water lines are connected to provide a rinsing spray to the board to remove the disinfectant and any debris left on the board after having been brushed. While it is contemplated that the invention could include a further chamber for blowing air over the board to effect drying of the board's surface, it has been determined that such action is not necessary and that air drying of the board is sufficient for most applications.

Turning now to FIG. 3, there is shown a front exploded perspective view of the apparatus of FIG. 1. As can be seen, the apparatus includes an inner chamber within the housing 12. The inner chamber is formed by internal sidewalls 44 and 46 which, together with partitions 34 and 36 form the three sections 26, 28 and 30 through which the board passes in being cleaned. The housing 12 includes an outer sidewall 48 which is shown removed to expose the control mechanism associated with the cleaning apparatus. The control mechanism includes an electric motor 50 connected for driving a pair of pulleys 52 and 54 which are connected to shafts of the rotatable brushes 32. In the illustrative form, the pulleys 52 and 54 are connected to a second pulley (not shown) attached to the rotating rotor of the motor 50. As will be appreciated, the V-belt 55 passes sequentially around the outer surfaces of the pulleys 52 and 54 thus causing those pulleys to be rotated in a common direction.

Disinfectant fluid such as "Sterigent, available from Spartan Chemical Company", is stored in a tank 56 mounted in the housing between the partition wall 46 and the outer cover 48. Near the tank 56 is a pump 58 which is utilized to assure a constant volume of water flow into the fluid delivery system of the cleaning apparatus. A cutoff valve 60 is attached to the pump outlet to prevent back flow of fluid into the system and pressurization from an external water source when the pump is not operating. The pump may, for example, be a constant volume pump putting about 50 psi pressure at each spray nozzle of the system. As is shown in FIG. 3, the fluid delivery system in each

of the sections 26 and 30 includes multiple pipes 38, 40, 42 with each of the pipes having multiple nozzles 62 spaced along their length.

Water is connected through appropriate piping (not shown) to the pump 58 which controls the flow of water into the fluid delivery system.

Turning to FIG. 4, which shows an opposite side exploded perspective view of the cleaning apparatus 10, the plumbing for the water delivery system can be seen to comprise a first line passing under the cleaning chamber defined within the housing and exiting as line 64. The line 64 then branches to feed water to the first pair of pipes 38 in the front section 26 via line 66 while feeding water via line 68 to the second pair of lines 40 in section 26. Tubing 70 coming from the disinfectant storage tank 56 also passes under the closed chamber 51 and is coupled into the fluid line 68. The coupling for tubing 70 is at a venturi 72 so that the disinfectant is drawn into and mixed with the water flowing in the line 68 before the resultant fluid is sprayed onto the board 18. Water from line 64 is also directed via line 74 into the spray lines 42 in section 30 in order to provide rinse water to a board 18. Note that the chamber 51 is defined as a separate contained chamber within the housing 12 so as to isolate the fluid from the sides of the chamber where the various connections and electrical components are connected. As shown in the exploded view of FIG. 3 and FIG. 4, the chamber 51 includes its own cover 76 which is designed to seal the chamber and prevent the escape of any of the liquid over the top of the chamber. The housing is completed by top cover 78 and a left side cover 80.

Referring to FIG. 5, there is shown a cross-sectional view taken laterally through the brush section 28. It can be seen that each of the brushes 32 ride on separate axles 82 and 84 which pass through and are supported by the side members 44 and 46 defining the chamber 51. Appropriate seals are provided at the point where the axles pass through the walls 44 and 46 to prevent leakage of the fluid from within the chamber 51 into the other elements located outside the chamber within the housing. As can be seen from the cross-sectional view, the chamber 51 is essentially an inner lining which retains and controls the chemicals and water and directs them to a controlled drain 20 for appropriate disposal. The partition 34 and 36 serve to separate the chemical treating portion of the

chamber 51 from the rinse water treating portion. Preferably, the chamber 51 is shaped with slanted floors so the chemicals and water is directed to the drain located at a bottom center point of the chamber. Watertight seals are used to assure that none of the chemical is lost from outside the chamber except through the drain 20. It is generally desirable to make this arrangement since the chemicals have to be discarded in accordance with local health rules and there is always a concern with contamination of the disposed chemicals or water from cleaning of body fluids from the medical boards 18.

FIG. 6 is a cross-sectional view taken lengthwise through the apparatus 10 and shows one form of canting of the internal sections of the chamber 51 so as to direct the various fluids toward a center drain 20. FIG. 6 also shows a better view of how the nozzles 62 are arranged to spray fluid onto a board passing through the apparatus 10.

The brushes 32 are positioned in the chamber 51 in such a position as to completely contact all surfaces of the medical board being cleaned. While the preferred drive for the brushes 32 is a belt drive, it is also possible that the drive could be a chain drive or multiple motors could be utilized with a direct drive to the rotating brushes. Preferably, the power switch 24 is arranged and connected to energize both the pump 58 and the motor 50 at the same time so as to assure that both cleaning components of the system are operable. Appropriate circuit protection may be incorporated with the switch, the drive motor and the pump to inactivate the system in the event of an electrical problem.

While the invention has been described in what is presently considered to be a preferred embodiment, various modifications will become apparent to those skilled in the art. It is intended, therefore, that the claims not be limited to the specific disclosed embodiment but be interpreted within the spirit of the invention.